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AUTHOR Mirochnik, Elijah
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ABSTRACT

Prior to the 20th century the picture of a pre-designed universe was paralleled by the idea that only an external authority, like a deity or a scientific system of verification, could confirm what was or was not genuine knowledge. Today, the idea that knowledge and external authority are symbiotic partners continues to buttress descriptions of teaching and learning within the university design studio. Some observers believe that architects possessing privileged knowledge are entitled to count or dismiss what a student knows based on the extent that a student's performance of a design task complies with teacher expectations. Louis Sullivan's and William James's writings reveal an alternative picture in which a person's presence within their own body-in-the-world experiment is the entire basis for knowledge made inside of experience. Knowledge in design education, rather than requiring a body of knowledge, emerges within an experiential interaction in which teacher and student make meaning of their relationship with one another. (Author/MM)

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KNOWLEDGE OF BODY:
AN OTHER PICTURE OF ARCHITECTS AND DESIGN EDUCATION

Elijah Mirochnik
University of California at Berkeley
College of Environmental Design
Department of Architecture

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Author Can Be Reached At
Office: (510) 642-0832
Home: (510) 549-3929
FAX: (510) 643-5607
E-mail: elijah@ced.berkeley.edu

Correspondence:
Ph.D. Program
Graduate Office Room 370
Wurster Hall
University of California at Berkeley
Berkeley, CA 94720

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ABSTRACT

Prior to the twentieth century the picture of a pre-designed universe was paralleled by the idea that only an external authority, like a deity or a scientific system of verification, could confirm what was or was not genuine knowledge. Today, the idea that knowledge and external authority are symbiotic partners continues to buttress descriptions of teaching and learning within the university design studio. Some observers believe that architects possessing privileged knowledge are entitled to count or dismiss what a student knows based on the extent that a student's performance of a design task complies with teacher expectations. Louis Sullivan's and William James's writings reveal an alternative picture in which a person's presence within their own body-in-the-world experiment is the entire basis for knowledge made inside of experience. It will be argued that knowledge in design education, rather than requiring a body of knowledge, emerges within an experiential interaction in which teacher and student make meaning of their relationship with one another.

Knowledge Of Body: An Other Picture of Architects and Design Education

ELIJAH MIROCHNIK
University of California at Berkeley

INTRODUCTION: DIVINE DESIGN AND BODIES OF KNOWLEDGE

The design for the universe, it was generally assumed before Darwin's time,[1] had been completed, and, the many parts of the design, built. It's parts would remain in the permanent place that God's blueprint had specified. In this view, knowledge was the sum total of all the bits and pieces of the blueprint. Personal experience, in this view, had no place in the discovery of knowledge since the universe existed apart from the humans who happened to discover its various parts.

For those who held these notions the scientific method, which subjects all statements to the test of independent and impartial criteria, ideally enabled an objective knowledge of the universe.[2] Science required that its practitioners detach themselves from their work to assure that experiments they submitted as proof of new knowledge were not tainted by personal bias. The result of detachment from one's own experience was that only genuine pieces of objective truth were ultimately admitted to an ever expanding body of knowledge.

The pre-twentieth century view, described above, was of a universe designed and built by a divine creator who had the solitary privilege of viewing the design in its entirety. Real knowledge of our world and the universe beyond, science insisted, was not what we viewed in our imaginations but what we could prove was true despite our imaginations. Given the impossibility of contacting the divine creator, who would surely

know if someone had discovered a new piece of their blueprint, the scientific method seemed the perfect way to test and approve entry of new bits into an official body of knowledge.

The idea that the architect's knowledge is only as good as the scientific method, and a systematic body of knowledge that provides *objective* proof of an otherwise *subjective* idea or creation, has effected many in the fields of architecture and architectural education. Amos Rapoport, Professor of Architecture at the University of Wisconsin-Milwaukee, for example, views designing as an illegitimate method of problem solving that results in architects and students "reinventing the wheel" every time they face a new design problem. Urging those who teach design to adopt a scientific methodology and science-type body of knowledge, he writes:

"In setting explicit objectives for design, criteria are also set for evaluating how successfully goals have been met. When this process is repeated, there is hope of developing a cumulative body of knowledge and theory...It seems self-evident that both design goals and criteria of evaluation are always necessarily related to, and dependent on a theory; one needs first to know what built environments can do before one can assess whether any given specimen does it well or badly."[3]

Implicit in Rapoport's view is the need for architects to act more like scientists. Not only do scientists test specimens of newly discovered knowledge, their body of knowledge and theory help them decide which new specimens to add to or exclude from the ever growing body. With no theory to legitimize the entry of fact into a body of knowledge, Rapoport reports that, "design cannot be taught and is not really suitable as a university subject. Its approach is personal, subjective, illogical and not cumulative...it should not be taught since it perpetuates a highly undesirable state of affairs."[4]

Sociologist Herbert Simon echoes Rapoport's discomfort with the architect's "subjective, illogical" ways of knowing. In *The Sciences of The*

Artificial Simon writes, "There is no question...of the design process hiding behind the cloak of 'judgment' and 'experience'."[5] Similarly, Jon Lang in *Creating Architectural Theory* reports that,

"The shortcomings of much design philosophy arise from a general lack of understanding of the intricacies of life and what different patterns of the built environment afford people. Conclusions about how a particular design will work tend to be drawn from casual experience of the world rather than from a body of systematic knowledge."[6]

1: WHAT'S IT LIKE TO BE DESIGNING?

Central to questions about the architect's knowledge, is what architects know about the objects they design. How will a building effect people? Is it beautiful or ugly? How will it impact the environment? These are typical of questions that architects are expected to be expert at answering. The usual tendency has been to turn toward science and art for the answers. Many of those who prefer the scientific *discovered knowledge* approach promote the use of methods, tools, and systems.[7] The emphasis on so called "objective methodologies" marks a mistrust of the notion that the architect's primary tool is their own internal intuition. In general, the argument for adopting the use of an external set of tools is that hard scientific fact can be trusted whereas intuition, even if it is disguised as artistic genius, does not lead to the discovery of authentic knowledge.

Architects who insist that art is at the center of the design process lean toward the *transcendent knowledge* view of designing and design teaching.[8] They embrace intuition, and assert that good design happens through an awareness of a personal "inner voice". A moment of internal inspiration, they suggest, is a sign of an architect who works as an artist. As a result the building, once it is built, is art.[9] The building as art, while it expresses a

subjective point of view has inherent qualities considered separate from those of its creator. The personal experience of creating a building design is not an issue once it is out of the architect's hands and in the public realm where it is scrutinized and tested against a set of artistic standards that have been passed down through the ages. Passing the test of these standards is a sign of objectivity. The architect's knowledge, if the architect acts like an artist, is then viewed as objective knowledge.

Despite the effort to tell the story of designing in terms of a scientific and/or artistic process, architects have always acted in ways that distinguish them from both scientist and artist. Architects, for example, do not duplicate each other's designs the way that scientists duplicate one another's experiments in their attempt to find flaws or inconsistencies in the proof of a new discovery. And as a rule[10] architects do not complete their idea of the building at the same time that they build it, compared to artists whose direct manipulation of the materials of their medium results in a simultaneous completion of idea and object.[11] Yet, in many schools the conversation about the "best approach" to design education often boils down to a debate between teaching design as a science or an art.

Many of those who have investigated the nature of design education have framed their observations of the various ways of teaching design in terms scientific and artistic methodology.[12] Their tendency was to align their observations with the premise that, for architects, knowledge was driven by something that in the end could be said to be the thing that made designing an objective process. Logically, the search for a thing that made architect's work *objective* focused on methods of objectification rather than the designer's *own* experiences. So no one, it seems, took an interest in asking architects, themselves, "What's it like *to be* designing?" Experience *as*

actually had, for most observers, seemed to be a thorn of subjectivity that once removed would result in legitimizing the architect's knowledge as objective. In addition to these views is a view that emphasizes knowledge as it emerges in the experience of designing.

In section 2, to follow, this additional view of *making knowledge* will be shown to underlie Louis Sullivan's view of human interaction with building elements *as well as* knowledge as it emerges within the process of teaching design. Sullivan's new perspective was meant to challenge to the nineteenth century Beaux Arts system of architectural education that held that knowledge relies on external authority for validation. In section 3, William James's challenge to the conception of knowledge that underpinned nineteenth century empirical philosophy will be related to Sullivan's view of knowledge in designing and design education.

In section 4, William James's description of the similar process by which people interact with buildings *and* with other people will be proposed as a fruitful approach to research, observations, and descriptions of teacher/student interaction in the design studio. In section 5, the new lens that Sullivan and James used to describe the nature of knowledge will be compared to the traditional lens of viewing design studio interaction based on knowledge requiring objectification through an external source. It will be argued that knowledge in design education, rather than requiring a body of knowledge, emerges within an experience in which teacher and student make meaning of their interaction with one another.

2: LOUIS SULLIVAN: KNOWLEDGE OF BODY

Kindergarten Chats[13] was Louis Sullivan's study[14] of architectural education in the form of the story of the tutorial sessions between an architect

and a newly graduated architecture student. Through the voices of his characters, Sullivan asserts that knowledge is that which the knower sees, feels, absorbs, and understands within experience. Insisting that the existence of the architects "body and mind" is the essential condition that enables any knowledge *at all* to emerge Sullivan defines knowledge of objects as knowledge of one's interactive experience *of* objects. In this way he moved outside of the view that once the architect has "given birth" to their objects, the objects can be viewed and appreciated apart from the process by which they were conceived. At the same time he moved into a view that knowledge is intimate with experience.

The view of knowledge as made in the knower's experience is conveyed through dialogue between teacher and student. Architecture, the teacher points out, is not just a discipline in its own right, "..but also an art of expression."[15] But Sullivan is clear that expression does not mean that an "expressive form" inheres within buildings or natural objects. For Sullivan, because the art of architecture is actuated by human manipulation, form is expressed *as a quality* that emerges within the act of making architecture. This view radically departs from the idea that form is based on the existence of the "perfect and everlasting" forms by which the universe was designed and built.[16] An architect's knowledge of form, for Sullivan, emerges within an experiment where they find themselves fully aware of their part within that experiment. Rather than *detaching from* the experiment, the architect understands that *attachment to* it is what drives their desire for completion once there is something in it that captures their interest and imagination.

Sullivan's emphasis on the "entry of the personal," the view that form was expressive of experience, when his *Kindergarten Chats* articles first appeared in 1901, was an uncommon if not unheard of view. The common

view of the knowledge of objects, that set the standard for the Beaux Arts architectural education of the time, was based on systems of evaluating the goodness of the form believed to inhere within buildings and other designed objects. The Beaux Arts view insisted that an architect could know good form by testing to see if the building form complied with the rules of perfection and proportion that had guided architecture since the Greeks and Romans.[17] Knowledge of form was based on a set of objective standards that had nothing to do with the actual experience of those who created the objects being tested.

The move beyond this Beaux Arts basis of knowledge is most apparent in a chapter entitled "The Elements of Architecture: Objective and Subjective *Pier and Lintel* ." Here Sullivan describes a relationship between the *experience* of designing and the *knowledge* of the objects that architects create. There was no reason to validate this relationship, according to Beaux Arts canon, since knowledge was believed to exist outside of human experience. But Sullivan insists that it is *just because* the architect is in an actual bodily engagement with the simple inanimate objects of pier and lintel that knowledge *of* those objects is at all possible:

"In simplest terms, reposing, both, flat on the earth, pier and lintel cannot be distinguished one from the other: their potentiality[18] is the same. (It is only when by man's touch they are slightly differentiated, that they are separable, in evident function). Yet when erected into place by the power of man's mind and body, in response to his need, his desire...a new, a primitive FORM appears without and within man...What is essential to note is the entry of the personal or human element at the earliest primitive beginnings of the art."[19]

Function, for Sullivan, is synonymous with use. And use means the bodily interaction of the human creature within their own experiment. This is where Sullivan departs from the view of the knowledge of objects that preceded him. In that view form exists within objects apart from any one who attempts to discover it.

For Sullivan the "entry of the personal," that is the actual presence of a person in the scene of their own experiment, is exactly the condition for the emergence of form. He suggests that we do not come to know form by any mental exercise we perform "within." Nor do we have to go to the perfect Greek proportions located outside of mortal experience. Sullivan's assertion that form "appears without *and* within" recognizes the interactive intimacy of body (within) and world (without). The example of an architect's interactions with pier and lintel is brought forth as an example of the coalescence of bodily being and the world of architectural objects. *Knowledge of body*, a knower's sense of their own presence within an experience where knowledge is made, is Sullivan's move beyond the borders of a definition of knowledge that depends on a "body of knowledge" outside of experiences where building designs are created. This view of knowledge cuts beneath the assumption that architects must *either* prove the objectivity of their designs *or* make believe that they somehow magically transcend their own experiences.

3: WILLIAM JAMES: INSIDE THE TISSUE OF EXPERIENCE

William James's call for a "radical" empirical philosophy[20] coincided with Sullivan's move beyond the traditional conception of knowledge outside of experience as a challenge to the standard notion of the architectural education of his time. James's 1904 essay, "A World of Pure Experience," furthers our understanding of Sullivan's move *from* a conception of form as inherent in objects *to* form as the knowledge that emerges within our human interaction with objects. James departed from previous philosophical theories that viewed knowledge as an immediate cognitive phenomenon. For James knowledge does not "just happen", but happens because cognitive

creatures undergo a continuous bodily interaction with a world of other bodies, things, places, and events.

Some characteristics of James's theory of *knowledge making* are useful. First, knowledge is a process in which we come to know over time. Empiricist philosophers that preceded James asserted that the very having of thoughts counted as knowledge if the thinker logically deduced whether or not their mental picture corresponded to something actual in the "real world". James, on the other hand, explains that mental images are starting points for further investigation. The work of bodily engagement with the world, not just mental calisthenics, underlies the emergence of knowledge and meaning.

In "A World of Pure Experience" James recounts having a mental picture of a lecture hall that is familiar to him. But for James having the mental image, in itself, is not knowledge. Knowledge comes at the end of the work one must do as their ideas seek fruition in a world coalesced with the body. The mental image marks the beginning of a series of actions taken, places seen, paths followed, scene after scene transitioning from next to next. The mental image had at the beginning of a situation is retroactively understood to be knowledge when an experience reaches a consummation (In James's example when he arrives at the building he, at first, had in mind). Emphasizing the work involved in making knowledge, James writes:

"Knowledge of sensible realities... comes to life inside the tissue of experience. It is *made;* and made by relations that unroll themselves in time. Whenever certain intermediaries are given, such that as they develop towards their terminus, there is experience from point to point of one direction followed, and finally of one process fulfilled, the result is that *their starting-point thereby becomes a knower and their terminus an object meant or known.*"[21]

For James, *making sure* is synonymous with *making knowledge*. Making sure of our ideas does not happen in the mind but in a reality where the body engages with the world.

A second characteristic of James's "radical empiricism" is that individual cognition must bear the consequence of a world of other individuals demanding to know what is meant by ideas in other minds. As a way of getting this across James, himself, poses the possibility of the public scrutiny of his private ideas. For example when he writes, "If *you* ask what I meant by my image (of Memorial Hall), and...I am uncertain whether the Hall I see be what I had in mind or not..."[22] he suggests one of many possible public calls for him to explain himself. In response to this public challenge James describes a set of possibilities that include saying nothing, pointing in a wrong direction, and being uncertain if the building he faces matches the one he pictures in his mind. These are obviously unsatisfactory explanations of what the picture in his mind means, and so James poses an alternative scenario to account for his ideas.

Speculating on what might happen when he arrives at the hall, James argues, "...if in its *presence* I feel my idea however imperfect it may have been, to have led hither and to be now terminated...my idea must be...cognizant of reality."[23] Here we find a third characteristic of the view of knowledge as made in experience, namely, that the knower's *presence*, their body in relation to some thing in the world, enabled their conception of that thing to be known as having actual meaning beyond mental ideation. For the knower the building was not immediately known, even though there was, *in the beginning*, a picture "in mind". Actions taken within an undergone experience, were realized to have been driven by, and had their start with, a desire to overcome any felt doubt as to what was actually meant by an idea.

The knower came to recognize themselves *as* the knower because they underwent an experienced *beginning, middle, and end* to their feeling of doubt. Their *presence* within a live experiment was the entire basis for knowledge made within their own experience.

Living interaction with the world since the picture of the building came to him, James insists, is *all* that can be known of the meaning of that picture. No matter what was specifically undergone to get from place to place, there was a real world to be dealt with every step of the way. That world, the day of the walk to the hall, could have been perfectly sunny, warm, and toasty or miserably frigid, wet, and windy. But no matter what human creatures within their environment have to put up with, it is their presence within their own interactive experiment and their process of undergoing and enduring the conditions of that experiment that gives their experience its form; its sense of fulfillment.

4: SPACE IN COMMON

The architect's ideas, for Sullivan, and human ideas, in general, for James are certified by one's continuous body-in-the-world experiment. But since the world of the individual is at the same time a world of others, accounting for interaction with others was essential for both writers. Sullivan, for example, speaking through the teacher's voice, tells his student, "the proof of all the statements I have made lies not in me, but in the broad populous world about you, present and past."[24] James, as seen below, explores the issue of interaction with the reader. Alluding to walk taken by both author and reader in a preceding passage in the essay, James argues that *the reader's* description of the building in *the reader's* mind may, indeed, differ from the picture in *his* (James's) mind,

"... but if each of us be asked to point out where his percept is, we point to an identical spot. All the relations, whether geometric or causal...originate or terminate in that spot wherein our hands meet...Just so it is with our bodies. That body of yours which you actuate and feel from within must be in the same spot as the body of yours which I see or touch from with-out. 'There' for me means where I place my finger...Your inner actuations of your body meet my finger *there*: it is *there* that you resist its push, or shrink back, or sweep the finger aside with your hand. Whatever farther knowledge either of us may acquire of the real constitution of the body which we thus feel, you from within and I from without, it is that same place that the newly conceived or perceived constituents have to be located, and it is *through* that space that your and my mental intercourse with each other has always to be carried on..."[25]

Each of the two persons in the above description make individual meaning of the building they perceive within their own experience. Undergoing the conditions of their body-in-the-world experiment, they each overcome their original doubts, and finally feel confident that the building they had "in mind" is, indeed, the building they each now face. Their act of pointing to an identical spot conveys that *both* have come to know the same building. Their personal experiences of coming to their knowledge of the building are anything but identical, but as each has made the knowledge of the building for themselves, they can now simultaneously locate the space in common *through* which their individual knowledge emerged. The space they locate, by pointing, can be entirely the same even if each conducts separate experiments within which they make individual meanings of that space.

Just as they each interact within their experiment that led each to a knowledge of the building, they similarly interact to know one another. Knowing the other is no mental or logical exercise. The other, as James points out, can resist a push, can shrink back, can sweep aside a finger.

Mental images do none of that. We make knowledge of the other just because their acts provoke us and we find ourselves feeling our experience as we undergo the interaction with them. We find that the world, its people, its buildings, puts itself in our face at every moment. Real people, real buildings push back. And so do we: we are just as much in the world's face as it is in ours. Whether it is a building we face, or another person we face we find the pushing and pulling coming from both sides as once.

The different pictures that emerge within each of us come though our interactive engagement with one another. We come to know not *just* by pushing another's body, prodding another's memory, handling another's outbursts, as if the other is the stimulus that *causes* us to respond predictably. Our vitally sensed experience with one another, our *knowledge of body,* underlies our process of making knowledge. Within that process, knowledge comes where and when we complete our experience of making certain what the engagement with *another* means to *us*.

5: AN OTHER PICTURE OF DESIGN EDUCATION

In James's writings as well as in Sullivan's we find an *other* view of knowledge. Knowledge is made within experience with others. Space can be the common location of a building, a person, or an event that is seen and felt by any of a number of people who are occupied in the process of *making knowledge*, of understanding what that building, person or event means to them. Sullivan's *Kindergarten Chats* frames the design education event as the space in common that locates the interactive process within which teacher and student must account for the other's presence as well as their own. Knowledge made inside experience with others as a basis of design

education challenges us to face the assumptions behind our habit of picturing the architect doing the teaching as knowing something that the student doesn't.

This may not be easy for us, as it is a view of knowledge and education we have held for centuries. It dates back to a time when we believed that the universe was permanently fixed[26] and that knowledge was discovered outside of the discoverer's experience. The knowledge of architects, in this view, was based on the methods and techniques they used to objectify the ways by which they went about designing. The architects doing the teaching, because they had mastered certain techniques and methods, were viewed as endowed with the abilities that enabled the production of proof required to convince the world of the validity of their designs. This pre-twentieth century view of knowledge and education continues to buttress the descriptions of the university design studio in our own time, as seen in Donald Schon's observations:

"As the student begins to design, even when not sure how to do it and not knowing what needs to be known in order to learn to do it the studio master may help in two ways. He may demonstrate some part of the process he believes the student needs to learn, in which case he gives the student something to imitate. Or he may tell the student something about designing... in...which (case) the student is expected to listen...The student tries to grasp the meaning of the master's showing and telling and seeks to translate what is grasped into his or her performance. Each such performance...expresses the sense the student has made of what has been observed or heard and tests the means by which he or she translates that sense into the task of designing."[27]

Schon reflects our tendency to picture the teacher and student in a theatrical relationship where the teacher is the director and the student is a performer. In the design studio, Schon tell us, "...instruction...becomes subject to the demand that it be translatable into action...of the sort the instructor has in mind."[28] As students stage what they know, their

performances are reviewed based on their director's preconceived image of how a real designer acts. Students are pictured as dependent upon their teacher's external authoritative status to validate their knowledge. Sullivan and James give us an *other* picture to work with. That picture resists the tempting tradition of turning to an official external body to legitimize what counts or does not count as knowledge; what a teacher counts and does not count as an adequate student performance.

For Sullivan and James what counts as knowledge emerges within the experience of its makers. The interaction between teacher and student is the fundamental condition for the emergence of knowledge that either of them make individually. This *other* picture illustrates a move to cancel the subscription to an assumption that a teacher's knowledge is the ultimate factor enabling students to incrementally apprehend an understanding of design if they perform certain tasks properly.

Designing is more than a "task." Designing is the architect's experience in which ideas for a building that does not yet exist are known to have meaning *only because* those meanings emerge within the actual *presently* existing interaction among all of those who have a stake in the future of that building. In this sense what its like to be designing is closely related to what its like to be teaching design. In both cases architects recognize that they are not the only stake holder in the situation. Individual expression, personal voice, and significant design ideas emerge within a *present* process of interaction with others.

6: CONCLUSION: ATTACHMENT TO EXPERIENCE

Ironically our considerable interest in how knowledge emerges within the experienced interaction between stake holders in the design process, when

we view architects in their roles as practitioners, becomes a non-interest when we view them in their roles as teachers interacting with students. In practice, the presence of clients, contractors, code inspectors and others imposes a real environment of consequence that architects must constantly deal with. The same architect, that we see having to undergo the burden of working for the knowledge they make in practice, once they enter the studio is pictured in immediate possession of knowledge. We have overlooked this contradiction because we have bought into framing the teacher/student relationship in terms of an educational schema which insists that external authority is the essential requisite for knowledge. We seem locked into picturing the architect as that external source which sanctions student knowledge.

What has been shown here is that there is another lens, another approach to understanding the relationship between knowledge and experience *and* between teacher and student, besides the one we have most often used when viewing studio interaction. Because that lens is not filtered by the traditional assumption that knowledge requires external validation, an interesting possibility comes into focus: that knowledge in design education, rather than requiring a body of knowledge, emerges within an experience in which teacher and student make meaning of their mutually interactive processes. Researchers viewing architects and their students through this other perspective, understanding knowledge as made in experience that is continuous, would not preclude the possibility that investigating the relationship between the architect's experience designing and their experience teaching could reveal a philosophy of education built on a theoretical foundation independent of the pre-modern picture. Given a lens that pictures human interaction as *attachment to* rather than *detachment from*

experience, the new aim of the design education researcher would be the production of written works that engage their audience in readings created to capture the very qualities that teacher and student sense as they live the experience of learning with *and* from one another.

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NOTES:

[1] John Dewey, in an essay entitled, "The Influence Of Darwinism On Philosophy", discusses Darwin's theories in light of previous philosophies that argued for a pre-designed universe. Natural selection "cut straight under" the "design argument" because, "If all organic adaptations are due simply to constant variation and the elimination of those variations which are harmful in the struggle for existence that is brought about by excessive reproduction, there is no call for prior intelligent causal force to plan and preordain them." See John Dewey, *The Influence of Darwin On Philosophy And Other Essays in Contemporary Thought* (New York: Holt and Company, 1910)11-12.

[2] Israel Scheffler, *Science and Subjectivity,* (Cambridge, MA: The MIT Press, 1982) 1.

[3] Amos Rapoport, "Architectural education: "There is an urgent need to reduce or eliminate the dominance of the studio", in *Architectural Record,*172:12(October 1984)102.

[4] Rapoport, *Architectural Record,* 102.

[5] Herbert A. Simon, *The Sciences Of The Artificial* (Cambridge, MA: 1982) 144.

[6] Jon Lang, *Creating Architectural Theory, The Role of the Behavioral Sciences in Environmental Design,* (New York: Van Nostrand Reinhold Co., 1987) 12.

[7] Various works reflect the idea of objectifying the architect's designs and process of designing by certain methodological approaches. See the Herbert Simon and Jon Lang works mentioned above and also see L. Bruce Archer, "Systematic Design Methods for Designers", in *Developments in Design Methodology,* Nigel Cross (Ed.) (New York: John Wiley and Sons, 1984) *and* Horst Rittel "On the Planning Crisis: Systems Analysis of the First and Second Generation", in *Bedriftsoekonomen #8,* 390-396.

[8] The architect and artist's transcendental leap has various advocates. Christopher Jones writes, "To the extent that designers need to know the present before they can predict the future, they need scientific doubt and the ability to set up and to observe the results of a controlled experiment. But when they deal with the future itself, as opposed to the present, scientific doubt, is of no use, and some other ingredient, nearer to religious faith, has to be employed." See his *Design Methods: Seeds of Human Futures* (New York: John Wiley and Sons, 1970) 11. Christopher Alexander writes, "The nature of Space, being God-like, or at least 'not-passive', is such that the more whole it becomes, the more transparent, the more it seems to melt, the more it realizes itself, releases it own inner reality, the more transparent, the more transcendent." See his *The Nature Of Order, An essay on the art of building and the nature of the universe* (New York: Oxford University Press, In manuscript form not yet published) 36.

[9] Eliel Saarinen, for example, frames the architect's work in terms of what he calls creative vitality, an inner duality in humans, "...the fight between order and disorder, between accord and discord..." When this duality is "vitally concentrated at the very moment of creation...the concentrated vitality then is transported into form, and through form speaks its convincing language with lasting vibration." See *The Search For Form in Art and Architecture* (New York: Dover Publications, 1985) 146-147.

[10] For the exception to the rule, where an architect creates the building with no plans see Christopher Alexander, *The Timeless Way of Building,* (New York: Oxford University Press, 1979).

[11] "Architects," Dewey writes, "are obliged to complete their idea before its translation into a complete object of perception takes place. Inability to build up simultaneously the idea and its objective embodiment imposes a handicap. Nevertheless, they too are obliged to think out their ideas in terms of the medium of embodiment and the object of ultimate perception unless

they work mechanically and by rote". See *Art As Experience,* (New York: Perigee Books, 1980) 52.

[12] See for example Thomas Dutton, "Design and Studio Pedagogy", in *Journal of Architectural Education,* 41:1 (Fall 1987), Gabriela Goldschmidt, "Problem Representation Versus Domain of Solution in Architectural Design Teaching", in *Journal of Architectural and Planning Research,* 6:3 (1989) 204-215, *and* Donald Schon, *Educating the Reflective Practitioner* (San Francisco, Jossey-Bass, 1987).

[13] Louis H. Sullivan, *Kindergarten Chats and Other Writings,* (New York: Dover Publications, 1979).

[14] See Appendix 2 in the Mellon Foundation *Architectural Study* Volume 1, 1981 for an interesting description of studies of architectural education done in the United States. Interestingly, Sullivan's *Kindergarten Chats* is absent from their list of studies. The first architectural education study, according to the Mellon study, was conceived in 1919 and published in 1932. Sullivan published the *Kindergarten Chats* articles in *The Inland Architect* in 1901. Although *Kindergarten Chats* is not generally considered a study , Sullivan, writing to the editor of *The Inland Architect* described the work as "a psychological study...far and away beyond anything I have hitherto attempted...It will be the first serious attempt to test architecture by human nature and democracy." See *Kindergarten Chats,* appendices, page 144, letter dated February 22, 1901.

[15] Sullivan, *Kindergarten Chats,* 170.

[16] For list of works that deal with systems of architectural proportions from 1883 to the present see footnote #21 in Howard Salman, "Early Renaissance Architectural Theory and Practice in Antonio Filarete's *Trattato De Architettura,* in *The Art Bulletin,* 41:1(March 1959) 261.

[17] Leland M. Roth reports that architect Henri Labrouste, when he was a student at the Ecole des Beaux Arts, in the early 1820's, upset his teachers when he deviated from the rules that guided design. "For his last project," Roth writes, "Labrouste chose to study the ancient Greek temples at Paestum. In the course of working on these drawings, Labrouste came to a new understanding of the relationship between form and expressive structural function in Greek architecture, which determined the development of his own design. He scandalized his teachers in Paris when he sent back detailed drawings showing the temples in use rather than as remote Classical ideals, suggesting that buildings arise as expressions of unique functional and social environments and not as universal prototypes." See his *Understanding*

Architecture, Its Elements, History, and Meaning (New York: IconEditions An Imprint of HarperCollins Publishers, 1993) 444-445.

[18] Charles Sanders Peirce forwarded a similar view on the potentiality of objects. Using the example of an iron bar, Peirce asks, "Do you mean to say that a piece of iron not actually under pressure has lost its *power* of resisting pressure?" (*Collected Papers of Charles Sanders Peirce, Vol 1,* Hartshorne and Weiss, eds., 422) Referring to Peirce's question, John Dewey explains, "This power is actualized only under conditions of interaction with something, but it is there as a power nevertheless. Quality, *per se,* in itself, is precisely and exclusively, according to Peirce, this potentiality; it is like potential energy in relation to kinetic..." See John Dewey, "Peirce's Theory of Quality", in *The Journal of Philosophy,* 32:26 (December 19, 1935) 703.

[19] Sullivan, *Kindergarten Chats,* 121-122.

[20] James writes, "To be radical, an empiricism must neither admit into its constructions any element that is not directly experienced, nor exclude from them any element that is directly experienced...*the relations that connect experiences must themselves be experienced relations, and any kind of relation experienced must be accounted as 'real' as anything else in the system.*" See William James, "A World of Pure Experience", in *Essays In Radical Empiricism* (Cambridge, MA: Harvard University Press, 1976) 22.

[21] James, *Essays in Radical Empiricism,* 29.

[22] James, *Essays in Radical Empiricism,* 28

[23] James, *Essays in Radical Empiricism,* 28-29.

[24] Sullivan, *Kindergarten Chats,* 170.

[25] James, *Essays in Radical Empiricism,* 41.

[26] Robert Westbrook describes how the work of Heisenberg (in physics) related to the new picture of knowledge and the universe that was being simultaneously developed by American Pragmatist philosophers. See Robert B. Westbrook, *John Dewey and American Democracy* (Ithica, New York: Cornell University Press, 1991) 352-360.

[27] Donald A. Schon, "The Architectural Studio as an Exemplar of Education for Reflection-in-Action", in *Journal of Architectural Education,* 38:1(Fall 1984) 6.

[28] Donald A. Schon, *Journal of Architectural Education,* 7.